Bede Scientific — A History of Innovation

Bede Scientific, the UK based manufacturer and supplier of materials characterisation systems, is well known amongst the III-V community for supplying innovative answers to materials characterisation needs. Formed in 1978 and located in Durham, the company recently secured venture capital finance which it is using to expand the business and develop new products. Many of these are now being launched, and more products are due for the end of this year.

The first company in the world to supply a dedicated high resolution diffraction instrument for quality control, Bede has continued to strengthen its lead in this fast growing market sector with dedicated QC instruments providing a range of functionality from desktop single point analysis to a combined HRXRD/ Room Temperature PL system.

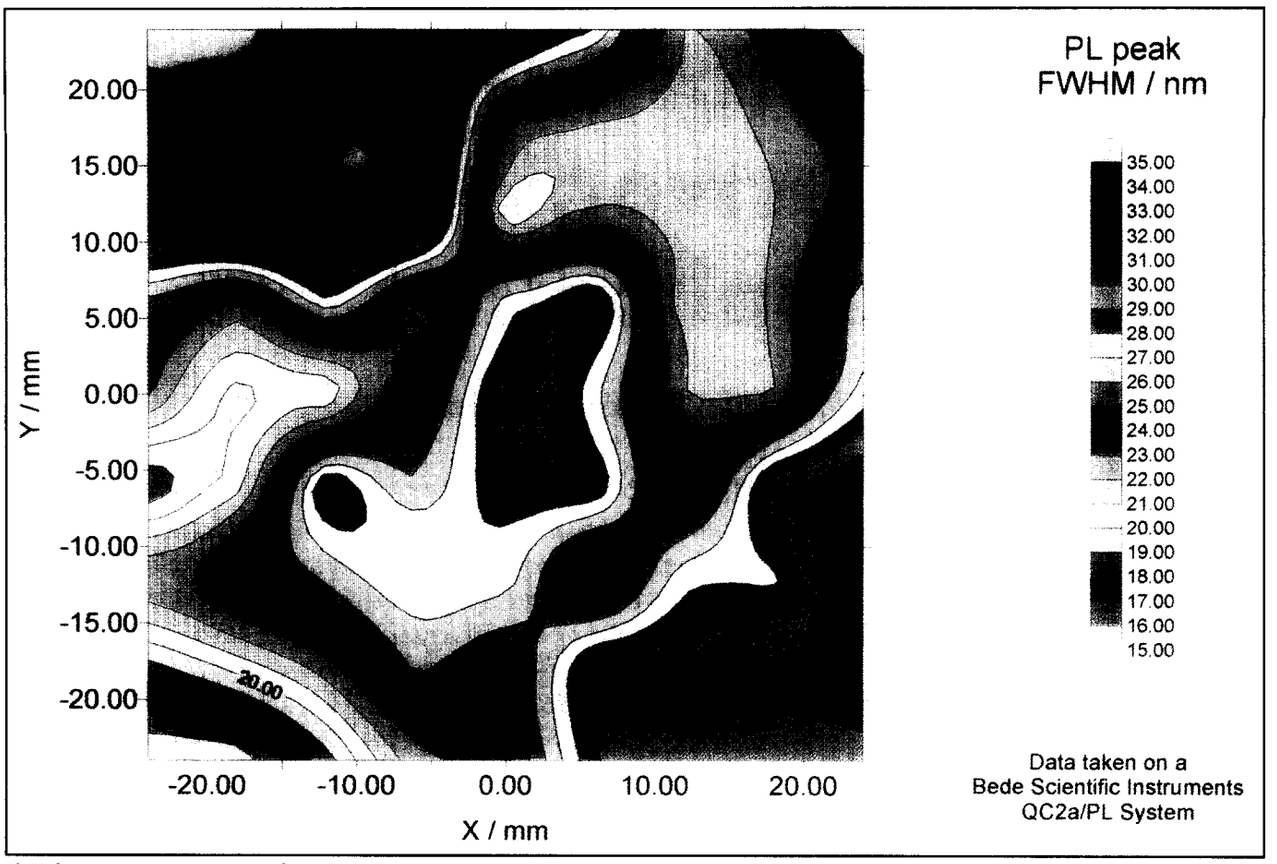
However, Bede's expertise is not limited to the QC field. As one of the first suppliers of HRXRD systems, the company has built on its user base of over 300 installed systems worldwide to lead the market continually in advanced X-ray analysis systems. The top-of-the-range D^3 system was the world's first direct drive diffractor, and with a resolution of only 0.15", it maintains its position as the most accurate and versatile in the world. Bede was the first company to provide a Triple Axis Stage for reciprocal space mapping and was at the forefront of popularising this previously unknown technique. Bede was also the first company to provide systems for X-ray reflectivity, recently adding the first commercially available diffuse scatter simulation software to the product range.

All this innovation has not gone unnoticed. The winner of a UK 1991 Queen's Award for Technology, Bede recently won a government award for the development of the QC2a/PL, the world's first combined HRXRD and PL system. This innovative instrument uses a fibre optic delivery system to allow both measurements to be taken on the sample at the same point, saving on handling and analysis time and reducing the time required to collect data. In addition, the risk of wafer damage or contamination is minimised.

Bede directors at the presentation of their 5th Smart Award. Left to right: Ron Waite MBE, Alastair Waite, Carole Voordeman (presenting), Neil Loxley.

Bede's Application Scientist Dr Tamzin Lafford explains how, like many in the industry, Bede is also very excited about the recent advances in GaN-based devices, "As these new technologies are developed, people need a very precise understanding of the materials in order to be able to improve their growth techniques. Very good results have already been obtained by Bede and its customers using reciprocal space mapping on the D^3 system. As GaN devices become more readily available, Bede is well placed also to provide customers with rapid and straightforward characterisation with our range of QC instruments."

Bede also recently introduced the world's first fully integrated Brillouin Scattering Instrument, the BriSe. Brillouin Spectroscopy is in use in many laboratories around the world for



Photoluminescence area map of 0.3μm GaInP on GaAs.

studying elastic and optoelastic bulk properties of materials. In particular, surface Brillouin Spectroscopy (SBS) may be used to investigate elastic properties of thin films, interfaces and layered materials, and has been successfully used to detect polishing damage in semiconductor substrates. In common with its approach to X-ray characterisation, Bede has taken a technique formerly only employed by specialists on home-built equipment and de-skilled it, making it more suitable for non-specialists. The BriSc provides a complete, compact instrument which the customer is able to use from the day it is installed. The quality of the instrument is supported by scientists at the Department of Materials at Oxford University who helped develop the BriSc and now have the prototype system. Bede's primary consultant there is Dr Andrew Briggs, a renowned expert on acoustic microscopy techniques. He says of the BriSc: "It really is a splendid instrument. Bede has reduced the size from two full optical benches to a free standing cabinet measuring less than a metre square. We had the system collecting useful data within two days of its delivery to Oxford."

The move into optical characterisation systems is no accident, as Dr Neil Loxley, Managing Director explains: "Although Bede has historically worked in the X-ray characterisation field, we realised that our strength was actually in providing answers to customers' materials characterisation problems. We therefore decided to look at other techniques that would complement our range of X-ray scattering instruments. By looking at both well-established and newly emerging techniques with a fresh pair of eyes, we have been able to provide complete integrated systems, often with dramatic savings in size, power requirements and complexity."

Dr Loxley is certain of the reason for Bede's continued success: "Bede has always been an innovative company, able to deliver state-of-the-art instrumentation to our many users, and grow our technology in line with theirs. Our extremely strong links to the academic world through Professor Brian Tanner of Durham University and Professor Keith Bowen of Warwick University (both directors of Bede) help us to spot new applications and characterisation techniques at an early stage and then to support any instruments developed with an unparalleled level of scientific support. However, a company is nothing more than a collection of individuals working together for a common purpose – it is the skills, quality and dedication of our staff, that keeps Bede ahead of its competitors."

Neil is confident of what the future holds: "Bede is now in its 18th year of operation with hundreds of satisfied customers world-wide. With the recent injection of venture capital and a range of new product developments in the pipeline, the company is set for a period of rapid and sustained growth. In years to come Bede will be as synonymous with materials characterisation as Hoover is with cleaning carpets!"